

# NOTES ON THE BIOLOGY OF NOTADEN NICHOLLSI PARKER (ANURA; LEPTODACTYLIDAE)

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Little is known of the biology of the frog *Notaden nichollsi* Parker, and the larva is undescribed. In November 1961 the present authors were able to dig from their burrows adult *Notaden nichollsi*. During the summer of 1962 one of us (P.S.) collected larvae of the same species. The information obtained is presented below and the larva described.

## NON-BREEDING ADULTS

On November 3, 1961, two individuals were dug from burrows in sand, 14 miles south-east of Derby. The area was a sparse *Eucalyptus* woodland with an understorey of *Acacia*, *spinifex* (*Triodia*) and other grasses (see Fig. 1). Much of the soil was visible. Burrows were readily located by walking over the area where the raised rim and loosely filled central crater of the burrow could be seen. By excavating a hole adjacent to the burrow the loose fill of the burrow was permitted to run out. The excavation was continued until the aestivating frog was exposed.

Three burrows were excavated; one yielded no frog at 68 inches in depth. Two others in a site where about 18 inches of soil had been removed by a bulldozer contained frogs at 44 inches. These last two holes also each contained an individual of *Glauertia mjobergi* (Anderson). The burrows were 1.5 inches in diameter and vertical. Those containing frogs were dry to 24 inches and then moist to the bottom. Soil temperatures were taken with a Schultheis



Fig. 1.—Habitat of *Notaden nichollsi*.

—Photo A. R. Main

thermometer; the top 4 inches were 36.5° C. *Glauertia mjobergi* were found at 29 and 35 inches where the temperature had fallen to 33.6° C. This was the temperature of the frogs at the bottom of the burrows.

## LIFE HISTORY

### Breeding

Egg masses have not been seen. However one adult female collected by Ealey (Ealey and Main, 1960) had fully developed ovarian eggs which were 1.3 mm. in diameter. The animal pole was black and yolk white. The size of the eggs and pigmentation are typical of frogs which lay eggs in water. It is not possible to suggest the nature of the egg mass. No precise date of spawning is known. Mature specimens appear in numbers during the first heavy rains which suggest that this is the time of spawning. During 1962 mid-January would be the earliest possible spawning time.

### Larvae

A total of 16 larvae as well as some freshly metamorphosed frogs and rather large juveniles were collected at Munkayarra, 15 miles south-east of Derby, on March 11, 1962. The locality is situated in a flat valley 200 yards wide between two tree-covered sand ridges. General conditions are as shown in Fig. 1. Non-aquatic grasses are common and are partly submerged after rain which forms pools about 4 to 12 inches in depth. These vary in size from a few square feet to half an acre and are connected by a slow running stream seldom more than an inch in depth. The stream empties into Munkayarra swamp where only *Cyclorana dahl*i were collected.

The temperature of the water varied from 26° C in shaded portions to 34° C. The running water was 34° C. The stream and most of the pools were dry two weeks after specimens were collected.

The 16 larvae obtained were staged from Gosner (1960) with the result shown in Table 1.

TABLE 1—STAGES AND SIZES OF 16 LARVAE OF *NOTADEN NICHOLLSI* PARKER, COLLECTED NEAR DERBY, MARCH 1962.

	Stages (Gosner, 1960)						
	37	38	39	40	41	42	43
Number of specimens	4	4	3	1	1	1	2
Body length in mm.	12.4*	13.4*	13.1* (mean)	13.9	14.4	13.3	15*
Tail length in mm.	16.6*	18.4*	18.4* damaged		19.2	16.8	—
Ratio Body : Tail	1.35	1.37	1.4		1.33		

\*Mean of measurements of all larvae at this stage.

### Description of larvae

Body oval, sides tend to be parallel. Spiracle opens in the lower half of body, not visible from above. Opening of spiracle slightly oblique to almost horizontal. Aperture not constricted and closely applied to body. Anus on median tube and not constricted.

Eyes oblique. Large triangular papillae across bottom of mouth.

Small papillae around corners of mouth. Teeth in  $\frac{2 \quad 1 \quad 2}{2 \quad 2}$  arrangement

ment, the outermost lower row about  $\frac{2}{3}$  length of preceding row. The dorsal skin of body is smooth and lightly mottled until stage 41 when the warts and adult colouration appear. There is a broken pale mid-dorsal line in most tadpoles. Tail is heavily pigmented, dorsal crest mottled, ventral crest clear for first half then posterior part mottled. Depth of tail, including crests from slightly less to not much more than depth of body.

The freshly metamorphosed frogs are 13-14 mm. long and have the colouration and skin pattern of adults.

The larvae of *Notaden* are small (33-34 mm. total length) when compared with the larvae of *Cyclorana platycephalus* (the water holding frog) (70 mm. total length) whose adult is of comparable size to adult *Notaden*.

*Cyclorana platycephalus* larvae may take 40 days to metamorphosis. The smaller froglet of *Notaden nichollsi* may require an even shorter period, which would be an adaptation to the ephemeral waters in which the species breeds.

#### DISCUSSION

Despite the absence of information there have been in the past several conjectures regarding the type of larval life. Fletcher (1889: 360) after discussing species of *Pseudophryne* which do not oviposit in water says: "Other Australian frogs, more particularly *Myobatrachus gouldii* (sp) from West, and *Notaden bennetti* Gthr., from East Australia, perhaps also *Helioporus albopunctatus* Gr., may be expected to exhibit similar or perhaps more interesting modifications." Later (*op. cit.*, p. 361), after discussing low mean annual number of rainy days as well as the low average annual rainfall of areas of inland New South Wales from which *Notaden bennetti* was known, Fletcher concludes: "Hence in such a locality as this the frogs must sometimes be in great straits to get rid of their ova, if oviposition is of the ordinary character; and the young must often develop under difficulties unless there is some adaptation to circumstances."

Main *et al.* (1959) suggest that only three species of Western Australian frogs lack an aquatic larval life, namely *Crinia rosea* Harrison, *Metacrinia nichollsi* (Harrison) and *Myobatrachus gouldii*.

These authors point out that the foregoing species all occupy the region of reliable rainfall and none occupy arid regions. In their summary Main *et al.* list aquatic embryonic and larval life, opportunistic breeding, short larval life, larval tolerance of high water temperatures, and finally efficient adult burrowing as characters which allow successful occupation of Australian deserts. Thus these authors envisage different specialisations from those anticipated by Fletcher. In the absence of a precise spawning date it is not possible to assert that larval development of *Notaden nichollsi* is rapid though the small size of the metamorphosing froglet suggest that

this is so. However, all the other information on the biology of *Notaden nichollsi* supports the inference of Main *et al.* that successful desert frogs have aquatic larval life and are tolerant of high temperatures at all stages of their life history.

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## STATUS AND DISTRIBUTION OF SOME SPECIES OF OWLS IN WESTERN AUSTRALIA

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In the second edition of Scriventy & Whittell's *Birds of Western Australia* (1951), the ranges of four of the species of owls occurring in the area dealt with are given as "state wide." About two years ago, in connection with a revision of the Australian owls, I began to examine museum material and published records of the four species concerned, and came to some rather unexpected conclusions as regards status and distribution.

Though full particulars will be published in my forthcoming revision, it may be useful to present the data hitherto assembled on Western Australia, in particular with a view to encouraging publication of field observations.

### Boobook Owl, *Ninox novaeseelandiae*

The Boobook Owl has rightly been regarded as state wide in distribution; it inhabits both the forest areas of the South-West and Kimberleys and the most arid parts of the interior. It is fairly common throughout its range.

### Winking Owl (Barking Owl), *Ninox connivens*

Of this species, originally I did not find any record outside the forested South-West and the Kimberley Division. At my request Dr.